

REMARKS

Claims 1, 2, 5, 6, 7, 9 and 10 have been amended to indicate that molded or cast articles are produced from the polyurethane elastomers of the present invention. Support for this amendment is found on page 8, lines 11-15, as well as on page 9, line 13 of the application.

New Claim 12 has been added to the application. New Claim 12 contains all of the limitations of Claims 1, 2 and 3.

Summary of the Invention:

Applicants' claimed invention is directed to a molded or cast article produced from a cellular polyurethane elastomer which is the reaction product of at least one higher molecular weight polyhydroxyl compound, 2,3,5,6-tetramethyl-1,4-diisocyanatobenzene ("durene diisocyanate") and water and/or at least one low molecular weight chain-lengthening and/or crosslinking agent.

Applicants' claimed invention is also directed to a molded or cast article produced from a compact polyurethane elastomer which is the reaction product of at least one higher molecular weight polyhydroxyl compound, durene diisocyanate and at least one low molecular weight chain-lengthening and/or crosslinking agent.

Finally, Applicants' claimed invention is directed to a molded or cast article produced from a filler-containing compact polyurethane elastomer which is the reaction product of at least one higher molecular weight polyhydroxyl compound, durene diisocyanate and at least one low molecular weight chain-lengthening and/or crosslinking agent.

The molded or cast articles of the present invention have increased color stability, have high-quality mechanical properties and are inexpensive to prepare. Additionally, prepolymers prepared from Applicants' claimed composition have high storage stability, resulting in longer, user-friendly processing time.

The Patent Office rejected Claims 1, 2 and 5 under 35 U.S.C. § 102(b) as being anticipated by DE 955,094 ("Windemuth et al."). Additionally, the Patent Office rejected Claims 6-11 under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 3,001,971 ("Scott et al.") in view of United States Patent No. 4,532,316 ("Henn et al."). Applicants traverse these rejections.

Rejection of Claims 1, 2 and 5 under 35 U.S.C. § 102(b):

The Patent Office rejected Claims 1, 2 and 5 under 35 U.S.C. § 102(b) as being anticipated by Windemuth et al. The Patent Office believes that Windemuth et al. disclose, in Example 3, chain extending with water a prepolymer to produce a cellular polyurethane which has a shape. The Patent Office believes that the cellular polyurethane produced by the process disclosed in Windemuth et al. would fall within the density claimed in Applicants' invention. The Patent Office further believes that the polyurethane produced by Windemuth et al. would be the same as that disclosed in Applicants' claimed invention regardless of what catalyst is used.

In order for a reference to anticipate, the claimed invention must be the same as that of the reference. See Glaverbel Societe Anonyme v. Northlake Marketing & Supply Inc., 45 F.3d 1550, 33 U.S.P.Q.2d 1496, 1498 (Fed. Cir. 1995). Any degree of physical difference, however slight, invalidates a claim of anticipation. See Ultradent Products Inc. v. Life-Like Cosmetics Inc., 39 U.S.P.Q. 2d 1969, 1980 (Utah 1996). Applicants' claimed invention is not anticipated by Windemuth et al. because Windemuth et al. do not disclose a molded or cast article produced from an elastomer having a density within the range of from about 0.2 to about 1.1 g/cm³.

As mentioned above, the Patent Office believes that Example 3 of Windemuth et al. illustrates a process which involves chain extending a prepolymer with water. Applicants respectfully disagree with the Patent Office's assessment of the teaching contained in Example 3 of Windemuth et al.

It is Applicants' position that Windemuth et al. illustrate, by way of their Example 3, a process for preparing a coated film which involves subjecting an isocyanate-terminated prepolymer to high temperatures to form a viscous mass. The isocyanate groups of the prepolymer disclosed by Windemuth et al. only become effective at high temperatures. See Windemuth et al., page 2 and Claim 3 of Windemuth et al. Windemuth et al. further disclose applying the viscous mass to a film. This film is then subjected to a final curing step which involves exposing the coated film to water vapor. Hexahydrodimethylaniline is present as a catalyst during the final curing step in order to accelerate the curing step. See, for example,

column 5, lines 5-17 of United States Patent No. 2,729,618, a copy of which is attached as Exhibit 1, which states that hexahydrodimethylaniline is used as a catalyst to accelerate curing reactions.

Additional support for Applicants' position that Example 3 of Windemuth et al. illustrates subjecting a coated film to a final curing step by exposing the coated film to water vapor is found in Saunders and Frisch, *Polyurethane Chemistry And Technology*, Part II (1964) ("Saunders and Frisch"), as well as in United States Patent No. 2,657,151 ("the '151 patent").

Page 463 of Saunders and Frisch indicates that an isocyanate-terminated prepolymer derived from polyesters can be effectively cured by exposure to the moisture in the air. See Exhibit 2. The '151 patent, a copy of which is attached as Exhibit 3, discloses preparing a coated fabric by coating a pre-treated textile with an isocyanate-modified polyester and then subjecting the coated textile to a final curing step by exposing the coated textile to water vapor which results in solidification of the isocyanate-terminated polyester. See the '151 patent, column 2, line 1; and column 3, lines 49-53.

Considering the foregoing, Applicants respectfully contend that Windemuth et al. do not disclose chain extending with water. Rather, it is Applicants' position that Windemuth et al. disclose subjecting a coated film to a final curing step which involves exposing the coated film to water vapor for 24 hours. As mentioned above, Applicants' claimed invention is directed to a molded or cast article which is prepared from either a cellular or compact elastomer. It is well known in the art that molded or cast elastomers are not finally cured until after the elastomer is removed from the mold or cast. In hot cure casting systems, for example, after an elastomer is removed from a mold it is subjected to a final curing step which involves exposing the elastomer to heat. See Exhibit 4, Oertel, *Polyurethane Handbook* (1985), page 378.

The Patent Office believes that Example 3 of Windemuth et al. illustrates a process for producing a cellular polyurethane. Applicants respectfully disagree with the Patent Office's assessment of the disclosure contained in Example 3 of Windemuth et al.

As mentioned above, it is Applicants' position that Windemuth et al. illustrate, by way of their Example 3, a process for preparing a coated film which involves subjecting an isocyanate-terminated prepolymer to high temperatures to form a viscous mass. The isocyanate groups of the prepolymers disclosed by Windemuth et al. only become effective at high temperatures. See Windemuth et al., page 2 and Claim 3 of Windemuth et al. Windemuth et al. further disclose applying the viscous mass to a film. This film is then subjected to a final curing step which involves exposing the coated film to water vapor. Hexahydrodimethylaniline is present as a catalyst during the final curing step in order to accelerate the curing step.

Page 463 of Saunders and Frisch indicates that an isocyanate-terminated prepolymer derived from polyesters can be effectively cured by exposure to the moisture in the air and that any generation of carbon dioxide during the curing is sufficiently slow so that diffusion of the carbon dioxide gas from the film occurs without bubble formation. See Exhibit 2.

Considering the foregoing, Applicants respectfully contend that Windemuth et al. do not disclose a process for producing a cellular polyurethane. Rather, it is Applicants' position that Windemuth et al. disclose preparing a coated film and then subjecting that coated film to a final curing step which involves exposure to water vapor which results in solidification of the isocyanate-terminated polyester.

The Patent Office also believes that Example 3 of Windemuth et al. illustrates a process for producing a shaped coating. Applicants respectfully disagree with the Patent Office's assessment of the teaching contained in Example 3 of Windemuth et al.

It is Applicants' position that Windemuth et al. illustrate, by way of their Example 3, a process for preparing a coated film which involves subjecting an isocyanate-terminated prepolymer to high temperatures to form a viscous mass. The isocyanate groups of the prepolymers disclosed by Windemuth et al. only become effective at high temperatures. See Windemuth et al., page 2 and Claim 3 of Windemuth et al. Windemuth et al. further disclose applying the viscous mass to a film. This film is then subjected to a final curing step which involves exposing the

coated film to water vapor. Hexahydrodimethylaniline is present as a catalyst during the final curing step in order to accelerate the curing step.

Applicants respectfully submit that the coating disclosed by Windemuth et al. is not shaped. While the coating of Windemuth et al., after it is applied to a film, may take on the shape of the film to which it is applied, it cannot be said that the coating disclosed in Windemuth et al. has been shaped.

As mentioned above, Example 3 of Windemuth et al. discloses subjecting a coated film to a final curing step by exposing the coated film to water vapor which results in solidification of the isocyanate-terminated prepolymer. In contrast to Windemuth et al., Applicants' claimed invention is directed to cellular as well as compact elastomers which are used to produce molded or cast articles. The articles of Applicants' claimed invention, by virtue of the fact that they are either molded or cast articles, are shaped.

Considering the foregoing, Applicants respectfully contend that Windemuth et al. do not disclose a shaped coating. Rather, it is Applicants' position that Windemuth et al. disclose preparing a coated film and that, while the coating of Windemuth et al. may take on a shape when it is applied to a film, the coating of Windemuth et al. has not been shaped.

The Patent Office also believes that Example 3 of Windemuth et al. illustrates a process for producing a polyurethane which has a density which falls within the range of the density claimed in Applicants' invention. Windemuth et al. do not provide any teaching regarding the density of their claimed polyurethane. It is therefore Applicants' position that the Patent Office is merely speculating that the polyurethane of Windemuth et al. has a density which falls within the range of the density claimed for the elastomer of Applicants' claimed invention.

Page 479 of Saunders and Frisch indicates that the cross-linking density of an isocyanate-terminated prepolymer derived from polyesters is a very important factor which is dependent upon the molecular weight of the polyols and the ratio of trifunctional to difunctional polyols. See Exhibit 5.

Considering the foregoing, Applicants respectfully contend that the teachings of Windemuth et al. do not provide any factual basis to support the Patent Office's position that the polyurethane of Windemuth et al. has a density which falls within the range of the density claimed for the elastomer of Applicants' claimed invention.

The Patent Office also believes that the same polyurethane would be produced by Example 3 of Windemuth et al., irregardless of which catalyst is used in the process. Applicants disagree with this statement.

Page 481 of Saunders and Frisch indicates that while catalysts can be used to speed up the curing time for coatings, some catalysts such as, for example, tertiary amines, promote dimerization and trimerization and cause premature gelation which results in a decreased pot life of the coating. See Exhibit 6.

Considering the foregoing, Applicants respectfully contend that the teachings of Windemuth et al. do not provide any factual basis to support the Patent Office's conclusion that the same polyurethane would be produced by Example 3 of Windemuth et al., irregardless of which catalyst is used in the process.

Applicants respectfully submit that the foregoing arguments illustrate the fact that Claims 1, 2 and 5 are not anticipated by Windemuth et al. Applicants therefore respectfully request that the Patent Office withdraw its rejection of Claims 1, 2 and 5 under 35 U.S.C. § 102(b) and enter allowance of these claims.

Rejection of Claims 6-11 under 35 U.S.C. § 103(a):

The Patent Office rejected Claims 6-11 as being unpatentable under 35 U.S.C. § 103(a) over Scott et al. in view of Henn. The Patent Office believes that Scott et al. disclose a polyurethane elastomer which is the reaction product of a polyester, a hydroxy containing chain extender and durene diisocyanate. The Patent Office believes that the elastomer produced in Scott et al. has a density which falls within the range of the density claimed in Applicants' invention. The Patent Office concedes that Scott et al. do not teach a prepolymer process. However, the Patent Office believes that Henn discloses a polyurethane elastomer made from a prepolymer in which the chain extender is included in the prepolymer.

The Patent Office thus concludes that it would have been obvious to use the prepolymer method of Henn in the process of Scott et al. to produce elastomers having improved mechanical properties.

In order to support a rejection based on obviousness, the prior art must provide a motivation or reason for the worker in the art, without the benefit of the Applicants' specification, to make the necessary changes in the reference invention. See Ex parte Chicago Rawhide Manufacturing Co., 226 U.S.P.Q. 438 (PTO Bd. App. 1984). The mere fact that it is possible to find two isolated disclosures that might be combined in such a way as to produce a new compound does not necessarily render such production obvious unless the art also contains something to suggest the desirability of the proposed combination. See In re Bergel and Stock, 130 U.S.P.Q. 206 (C.C.P.A. 1961). It is impermissible to use Applicants' claims as a frame and the cited references as a mosaic to piece together a facsimile of the claimed invention. See Uniroyal Inc. v. Rudkin-Wiley Corp., 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).

Applicants contend that there is nothing in either Scott et al. or Henn which suggests that it would have been desirable to combine the teachings of Henn with those of Scott et al. Actually, the disclosure in Scott et al. suggests that it would have been undesirable to combine the teachings contained in Henn with those of Scott et al.

Contrary to the Patent Office's assertions, Scott et al. do not simply disclose a polyester polyol, a hydroxy containing chain extender and durene diisocyanate. Rather, Scott et al. disclose that in order to prepare an elastomer which has improved weathering characteristics, it is necessary to mix a certain amount of polyester with a certain amount of a specific diol. See Scott et al., column 2, lines 28-71; and column 3, lines 1-19. The polyester and diol are preferably mixed before reaction with the aromatic diisocyanate. See Scott et al., column 2, lines 33-36. Scott et al. also disclose the preparation of an elastomer which is resistant to degradation by sunlight and air and which is produced without the need for cross-linking.

Henn, on the other hand, is directed to s qment d, phas -s parating prepolymers which are the reaction product of a polyol, an isocyanate and a chain extender employed in a **specific manner** in order to satisfy **specific equations**. See Henn, columns 5 and 6. The prepolymer of Henn is preferably prepared by the prepolymer process, i.e., by first reacting an isocyanate with a polyol to form an isocyanate-terminated prepolymer and then subsequently reacting the isocyanate-terminated prepolymer with the chain extender. See Henn et al., column 10, lines 7-37.

When determining whether or not one skilled in the art would have found it desirable to combine prior art references, it is critical that the references be viewed **as a whole**. See Custom Accessories Inc. v. Jeffrey-Allen Industries, Inc., 1 U.S.P.Q.2d 1196 (Fed. Cir. 1986).

Applicants contend that, when assessing the disclosure of Henn, the Patent Office simply focused on the fact that Henn discloses a prepolymer. The Patent Office should have focused on the fact that Henn discloses the use of a prepolymer which must be prepared in a **specific manner** in order to satisfy **specific equations**. See Henn, column 5, lines 16-59. Additionally, the Patent Office should have focused on the fact that Henn discloses the use of a prepolymer which, upon curing, yields an acceptable elastomer.

Applicants also contend that, when assessing the disclosure of Scott et al., the Patent Office simply focused on the fact that Scott et al. disclose that an elastomer may be prepared with durene diisocyanate. The Patent Office should have focused on the fact that Scott et al. disclose a polymer which must be prepared by mixing a certain amount of polyester with a certain amount of a specific diol in a balanced manner so that there is an equivalent amount of aromatic diisocyanate to the molar amount of polyester and aromatic diol in order to produce an elastomer which has improved weathering characteristics. See Scott et al., column 2, lines 28-71; and column 3, lines 1-19. Additionally, the Patent Office should have focused on the fact that Scott et al. disclose a polymer

which can be used to produce an elastomer which is resistant to degradation by sunlight and air and which is produced without the need for cross-linking. See Scott et al., column 1, lines 22-23; and column 3, lines 47-49.

There is nothing desirable about combining the teachings of a disclosure which is directed to preparing an elastomer by mixing a certain amount of polyester with a certain amount of a specific diol in a balanced manner so that there is an equivalent amount of aromatic diisocyanate to the molar amount of polyester and aromatic diol or the teachings of a disclosure which is directed to preparing an elastomer without the use of a cross-linker with the teachings of a disclosure which is not only directed to a prepolymer, but to a prepolymer which is prepared in a **specific manner** in order to satisfy **specific equations** and which is preferably prepared by the prepolymer process. The skilled artisan, therefore, would have had no motivation to select the prepolymer process disclosed by Henn for the purpose of modifying the process disclosed in Scott et al. because he would have thought to do so would yield elastomers which either have insufficient weather resistance characteristics or which are not resistant to degradation by sunlight and air.

The Patent Office also believes that the elastomer disclosed by Scott et al. has a density which falls within the range of the density claimed in Applicants' invention. Scott et al. do not provide any teaching regarding the density of their claimed elastomer. It is therefore Applicants' position that the Patent Office is merely speculating that the elastomer of Scott et al. has a density which falls within the range of the density claimed for the elastomer of Applicants' claimed invention.

A rejection under 35 U.S.C. § 103 must have a factual basis. Page 479 of Saunders and Frisch indicates that the cross-linking density of an isocyanate-terminated prepolymer derived from polyesters is a very important factor which is dependent upon the molecular weight of the polyols and the ratio of trifunctional to difunctional polyols. See Exhibit 5.

Considering the foregoing, Applicants respectfully contend that the teachings of Scott et al. do not provide any factual basis to support the Patent Office's conclusion that the elastomer of Scott et al. has a density which falls within the range of the density claimed for the elastomer of Applicants' claimed invention.

Applicants respectfully submit that the following arguments illustrate the fact that Claims 6-11 are patentable over Scott et al. in view of Henn. Applicants therefore respectfully request that the Patent Office withdraw its rejection of Claims 6-11 under 35 U.S.C. § 103(a) and enter allowance of these claims.

CONCLUSION

For the foregoing reasons, Applicants respectfully request: that the amendment to Claims 1, 2, 5, 6, 7, 9 and 10 be entered; that new Claim 12 be added to the Application; that the rejection of Claims 1, 2 and 5 under 35 U.S.C. § 102(b) be withdrawn; that the rejection of Claims 6-11 under 35 U.S.C. § 103(a) be withdrawn; and that pending Claims 1-3 and 5-12 be allowed to issue as a U.S. patent.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 1, 2, 5, 6, 7, 9 and 10 have been amended as follows:

1. (Thrice Amended, Marked-Up) A [shaped] molded or cast article capable of withstanding high mechanical stress produced from a cellular polyurethane elastomer having a density within the range of from about 0.2 to about 1.1 g/cm³ which comprises the reaction product of:

- a) from about 65 to about 90 wt.%, based on the total weight of reaction product, of at least one higher molecular weight polyhydroxyl compound having an average molecular weight of from 500 to 6,000 and a functionality of at least 2;
- b) from about 10 to about 25 wt.%, based on the total weight of reaction product, of at least one 2,3,5,6-tetramethyl-1,4-diisocyanatobenzene; and
- c) from about 0.2 to about 10 wt.%, based on the total weight of reaction product, of water and/or at least one low molecular weight chain-lengthening and/or crosslinking agent having at least two hydroxyl groups and an average molecular weight of from 60 to 800.

2. (Twice Amended, Marked-Up) A process for producing the [shaped] molded or cast article of Claim 1 in which the higher molecular weight polyhydroxyl compound a) is first reacted with the diisocyanate b) to produce an isocyanate-terminated prepolymer and the prepolymer is then reacted with the chain-lengthening and/or crosslinking agents and/or higher molecular weight polyhydroxyl compounds.

5. (Once Amended, Marked-Up) The [shaped] molded or cast article of Claim 1 in which the cellular polyurethane elastomer is prepared in the presence of at least one catalyst selected from the group consisting of sodium salts and potassium salts of carboxylic acids in which the catalyst(s) is/are present in an

amount in the range of from about 0.001 to about 3 wt.%, based on the total weight of reaction product.

6. (Once Amended, Marked-Up) A [shaped] molded or cast article capable of withstanding high mechanical stress produced from a compact polyurethane elastomer having a density within the range of from about 1.0 to about 1.4 g/cm³ which comprises the reaction product of:

- a) from about 55 to about 90 wt.%, based on the total weight of reaction product, of at least one higher molecular weight polyhydroxyl compound having an average molecular weight of from 500 to 6,000 and a functionality of at least 2;
- b) from about 10 to about 25 wt.%, based on the total weight of reaction product, of at least one 2,3,5,6-tetramethyl-1,4-diisocyanatobenzene; and
- c) from about 1 to about 20 wt.%, based on the total weight of reaction product of at least one low molecular weight chain-lengthening and/or crosslinking agent having at least two hydroxyl groups and an average molecular weight of from 60 to 800;

with the proviso that a), b) and c) are reacted in the absence of moisture and/or blowing agents which have a physical or chemical blowing action.

7. (Once Amended, Marked-Up) A process for producing the [shaped] molded or cast article of Claim 6 in which the higher molecular weight polyhydroxyl compound a) is first reacted with the diisocyanate b) to produce an isocyanate-terminated prepolymer and the prepolymer is then reacted with the chain-lengthening and/or crosslinking agents and/or higher molecular weight polyhydroxyl compounds.

9. (Once Amended, Marked-Up) A [shaped] molded or cast article capable of withstanding high mechanical stress produced from a filler-containing compact polyurethane elastomer having a density greater than 1.2 g/cm³ which comprises the reaction product of:

- a) from about 55 to about 90 wt. %, based on the total weight of reaction product, of at least one higher molecular weight polyhydroxyl compound having an average molecular weight of from 500 to 6,000 and a functionality of at least 2;
- b) from about 10 to about 25 wt. %, based on the total weight of reaction product, of at least one 2,3,5,6-tetramethyl-1,4-diisocyanatobenzene; and
- c) from about 1 to about 20 wt. %, based on the total weight of reaction product, of at least one low molecular weight chain-lengthening and/or crosslinking agent having at least two hydroxyl groups and an average molecular weight of from 60 to 800;

with the proviso that a), b) and c) are reacted in the absence of moisture and/or blowing agents which have a physical or chemical blowing action.

10. (Once Amended, Marked-Up) A process for producing the [shaped] molded or cast article of Claim 9 in which the higher molecular weight polyhydroxyl compound a) is first reacted with the diisocyanate b) to produce an isocyanate-terminated prepolymer and the prepolymer is then reacted with the chain-lengthening and/or crosslinking agents and/or higher molecular weight polyhydroxyl compounds.

Claim 12 has been added to the Application to read as follows:

--12. A molded or cast article capable of withstanding high mechanical stress produced from a cellular polyurethane elastomer having a density within the range of from about 0.2 to about 1.1 g/cm³ which comprises the reaction product of:

- a) from about 65 to about 90 wt. %, based on the total weight of reaction product, of at least one higher molecular weight polyhydroxyl compound having an average molecular weight of from 500 to 6,000 and a functionality of at least 2;
- b) from about 10 to about 25 wt. %, based on the total weight of reaction product, of at least one 2,3,5,6-tetramethyl-1,4-diisocyanatobenzene; and

c) from about 0.2 to about 10 wt.%, based on the total weight of reaction product, of water and/or at least one low molecular weight chain-lengthening and/or crosslinking agent having at least two hydroxyl groups and an average molecular weight of from 60 to 800;

wherein the higher molecular weight polyhydroxyl compound a) is reacted with the diisocyanate b) in the presence of a chain-lengthening and/or crosslinking agent c) to produce an isocyanate-terminated prepolymer. --

marked up